

SSBC Safety Awareness Guide for Fabrication

While the particular circumstances are specific to each team that participates in the Student Steel Bridge Competition (SSBC), the following are general guidelines that universities are encouraged to consider when planning for the safety of students. This guide is intended to bring awareness to major safety concerns and is not intended to serve as a comprehensive safety plan nor does it supersede any requirements and regulations set by the school and shop facility.

Teaching and Advising

The American Institute of Steel Construction (AISC) would like steel bridge teams to fabricate skillfully, efficiently, and safely. There are many skills involved in steel fabrication. Proper teaching and advising is a key ingredient to students learning to perform these skills. Students should be taught each of the skills by qualified and knowledgeable personnel who can subsequently provide the supervision and mentorship that is necessary to develop full proficiency.

Managing Shop and Equipment Access

Each university should consider the degree to which close supervision is required among students who have been trained and mentored in each of the skills. The university may wish to restrict access to particular equipment, as necessary to provide adequate supervision. The ability to lock out particular equipment while allowing access to other equipment should be considered.

Long hours and exhaustion significantly increase the likelihood of accidents and injuries. Regular work hours that are reasonable and sustainable are strongly encouraged.

Basic Shop Attire

The following attire is recommended for the shop setting. Additional shop attire may be needed for particular operations.

- Safety glasses. If prescription eyewear is needed, OTG (over the glasses) safety eyewear should be used.
- Long pants
- Rugged leather shoes or boots

- Short-sleeved shirt or long sleeved shirt that is cuffed
- Long hair should be tied back in a tight bun.
- Loose-fitting clothing or dangling jewelry should not be worn.
- General hearing protection is recommended, with higher levels of protection for particular operations. Ear plugs are advisable for welding, torching, using a cut-off saw, and grinding to block sparks from entering the ear.
- Clothing should be cotton or natural-fiber fabric. No polyester.

Housekeeping

A clean and organized shop is essential, not only for student safety, but also for efficient and accurate fabrication. Walk areas should be clear, floors swept, tools organized, cords rolled up or coiled. Avoid routing cords on the floor.

Storage

- Cutting oils, lubricants, and solvents should be kept in a closed, metal cabinet when not in use. These materials should never be used near sparks or flames.
- All containers should be labeled to prevent confusion as to the contents.
- Gas cylinders should be firmly secured to carts or cylinder racks. Cylinders must be stored separately or in a cart when not in use. Acetylene and oxygen cylinders should be properly secured and separated.

Welding

Basic Welding Attire

- Welding helmet
- Welding gloves
- All exposed skin should be covered. A welding jacket or welding sleeves is recommended.
- Neck covers and welding caps can also be used.

The Welding Area

- Welding screens should enclose the welding areas.
- No paper, cardboard, rags or other combustibles should be allowed near the welding areas where they can be ignited by a flame, sparks, or hot items.
- The greatest possible air circulation or weld fume extraction should be provided.

Welding – Other

- Steel should be cleaned prior to welding in order to minimize fumes.
- If electronic (auto-sensing) welding helmets are used, students should be instructed in the use of the helmet's switches and settings. Students should be taught how to recognize when batteries need to be replaced, if applicable.
- Avoid being directly over the piece to avoid inhalation of fumes. Use fans to ventilate the area.
- Students should avoid welding zinc-coated steel parts (e.g. many steel bolts are zinc-coated). It is best to use black bolts (bolts that are not shiny) if it is necessary to weld the bolts. If zinc-coated parts must be welded, an air powered respirator (PAPR) that is specifically designed for this purpose should be worn. Additionally, a weld-fume extractor should be used in close proximity to the weld fumes for the protection of others and as a supplement to respirator use. If respirators other than a PAPR is used, they should be fit tested.

Abrasive Cutting and Right-Angle Grinders

- Work area should be closely screened to protect others from sparks or debris.
- Full-face shields should be worn.
- A high level of hearing protection should be specified for the operator. Modest hearing protection may be warranted for students who are nearby.
- Gloves and full skin protection (e.g., a welding jacket) should be worn. Gloves should be worn while transporting any cut steel if there are sharp edges.
- The workpiece should be firmly clamped in place.
- Do not set a grinder down while the blade is still in motion.

Drill Presses and Milling Machines

- The workpiece should be firmly clamped in place.
- Emergency shut-off switches should be located for quickest possible emergency use and students should be well-practiced in their use.
- The machines require the strictest possible prohibition on any loose items that may get caught in a spindle; e.g., hair, long sleeves, jewelry.
- Disconnect and be in control of the power before setting up the machine or changing bits.
- Never touch a moving spindle.

Loading

If you load test your bridge, assure it is blocked to prevent large movements. Bridges often fail laterally. Assure there is room to escape lateral movement of the bridge. Unload the bridge and store the load and parts before removing PPE.

Other Equipment

Each university should carefully consider additional equipment and the specific rules that should apply to this equipment.

Other Resources

Students and Faculty Advisors can establish a relationship with local steel fabricators, steel erectors, or local ironworkers training facilities for advice on proper welding and procedures.